

LISTING OF CLAIMS

This listing of claims replaces all prior versions and listings of claims in the patent application.

Claim 1 (currently amended): A dispersion shifted optical fiber comprising a core and cladding provided at an outer periphery of the core, and having a refractive index profile in which

the core is provided with a central core portion and a peripheral core portion having a higher refractive index than the central core portion provided at an outer periphery of the central core portion, and

the cladding has a lower refractive index than the peripheral core portion, wherein,

in a used wavelength band selected from 1490 to 1625 nm, the dispersion shifted optical fiber has an effective core area of ~~45~~ 75 to $130 \mu\text{m}^2$, a chromatic dispersion value of ~~-8 to +8~~ -6 to +6 ps/km/nm, a dispersion slope of 0.12 ps/km/nm² or less, a bending loss of 100 dB/m or less, and a cutoff wavelength that provides essentially single mode propagation

wherein a core comprises a central core portion and a peripheral core portion, and if $\Delta 1$ is a relative refractive index difference of the central core when the refractive index of the cladding is taken as a reference, and $\Delta 2$ is a relative refractive index difference of the peripheral core portion when the refractive index of the cladding is taken as the reference, and r_1 is a radius of the central core portion and r_2 is a radius of the peripheral core portion, then the following conditions a to d are fulfilled:

- a. $1.35\% \leq (\Delta 2 - \Delta 1)$
- b. $1.2 \leq r_2 / r_1 \leq 2.0$
- c. $\Delta 2 \geq 0.8\%$ and $1.8 \leq \Delta 2 \times (r_2 / r_1)^2 \leq 3.5$
- d. When the larger one from out of 0.8 or $1.8 / (r_2 / r_1)^2$ is set as $\Delta 2 \text{ min}$, and a ring inner volume is set as $\Delta 1 \times r_1^2$, and a ring outer volume is set as $\Delta 2 \text{ min} \times (r_2^2 - r_1^2)$, then the ring outer volume / ring inner volume is either 2 or more, or 0 or less.

Claims 2-5 (cancelled)

Claim 6 (currently amended): The dispersion shifted optical fiber according to claim 2 1, wherein b and c are within the numerical ranges given below:

b: $1.2 \leq r2 / r1 \leq 1.8$

c: $\Delta 2 \geq 0.8\%$ and $1.8 \leq \Delta 2 \times (r2 / r1)^2 \leq 2.7$

wherein the effective core area is 95 to 130 μm^2 .

Claim 7 (cancelled)

Claim 8 (currently amended): The dispersion shifted optical fiber according to claim 2 1, wherein $r2 / r1$ is 1.3 or more and $\Delta 1$ is 0% or less

wherein the dispersion slope is 0.10 ps/km/nm² or less.

Claim 9 (cancelled)

Claim 10 (currently amended): The dispersion shifted optical fiber according to claim 1, wherein the core comprises a central core portion and a peripheral core portion, and in a used wavelength band selected from 1490 to 1625 nm, the dispersion shifted optical fiber has an effective core area of 45 to 70 μm^2 , a chromatic dispersion value of -6 to +6 ps/km/nm, a dispersion slope of 0.05 to 0.08 ps/km/nm² or less, a bending loss of 100 dB/m or less, and a cutoff wavelength that provides essentially single mode propagation,

wherein, if $\Delta 1$ is a relative refractive index difference of the central core when the refractive index of the cladding is taken as a reference, and $\Delta 2$ is a relative refractive index difference of the peripheral core portion when the refractive index of the cladding is taken as the reference, and $r1$ is a radius of the central core portion and $r2$ is a radius of the peripheral core portion, then $\Delta 1$ is -0.3 to +0.3%, $\Delta 2$ is 0.8% or more, and $r2 / r1$ is 1.4 to 2.5.

Claim 11 (cancelled)

Claim 12 (currently amended): ~~The dispersion shifted optical fiber according to claim 10,~~ The dispersion shifted optical fiber according to claim 1, wherein the core comprises a central core portion and a peripheral core portion, and in a used wavelength band selected from 1490 to 1625 nm, the dispersion shifted optical fiber has an effective core area of 45 to 70 μm^2 , a chromatic dispersion value of -6 to +6 ps/km/nm, a dispersion slope of 0.05 to 0.08 ps/km/nm² or less, a bending loss of 100 dB/m or less, and a cutoff wavelength that provides essentially single mode propagation,

wherein $\Delta 1$ is 0%.

Claim 13-21 (cancelled)

Claim 22 (new): A dispersion shifted optical fiber comprising a core and cladding provided at an outer periphery of the core, and having a refractive index profile in which

the core is provided with a central core portion and a peripheral core portion having a higher refractive index than the central core portion provided at an outer periphery of the central core portion, and

the cladding has a lower refractive index than the peripheral core portion,

wherein the core comprises a peripheral core portion, a second ring portion, and a third ring portion provided in that order on the central core portion and when the relative refractive index difference and radius of the central core portion, the peripheral core portion, the second ring portion, and the third core portion are set respectively as $(\Delta 1, r1)$, $(\Delta 2, r2)$, $(\Delta 3, r3)$, and $(\Delta 4, r4)$ when the cladding is taken as a reference, then the dispersion shifted optical fiber has a refractive index profile in which $\Delta 1$ and $\Delta 3$ are set as negative values, $\Delta 2$ is set as a positive value, and $\Delta 4$ is set as 0 or more, and in a used wavelength band selected from 1490 to 1625 nm, the dispersion shifted optical fiber has an effective core area of 50 to 75 μm^2 , a dispersion slope of 0.03 to 0.06 ps/km/nm², a chromatic dispersion value of 0.5 to 8 ps/km/nm, a bending loss of 100 dB/m or less, and a cutoff wavelength that provides essentially single mode propagation.

Claim 23 (new): The dispersion shifted optical fiber according to claim 22, wherein the chromatic dispersion value is a negative value and $-0.50\% \leq \Delta 1 \leq -0.25\%$, $0.65\% \leq \Delta 2 \leq 0.85\%$, $-0.50\% \leq \Delta 3 \leq -0.25\%$, $0.0\% \leq \Delta 4 \leq 0.30\%$, $1.5 \leq r_2 / r_1 \leq 2.5$, $1.5 \leq (r_3 - r_2) / r_1 \leq 2.5$, $0.5 \leq (r_4 - r_3) / r_2 \leq 2.0$.

Claim 24 (new): The dispersion shifted optical fiber according to claim 22, wherein the chromatic dispersion value is a positive value and $-0.5\% \leq \Delta 1 \leq -0.05\%$, $0.75\% \leq \Delta 2 \leq 0.85\%$, $-0.50\% \leq \Delta 3 \leq -0.15\%$, $0.0\% \leq \Delta 4 \leq 0.3\%$, $1.5 \leq r_2 / r_1 \leq 2.5$, $1.5 \leq (r_3 - r_2) / r_1 \leq 2.5$, $0.5 \leq (r_4 - r_3) / r_2 \leq 2.0$.

Claim 25 (new): A dispersion shifted optical fiber comprising a core and cladding provided at an outer periphery of the core, and having a refractive index profile in which

the core is provided with a central core portion and a peripheral core portion having a higher refractive index than the central core portion provided at an outer periphery of the central core portion, and

the cladding has a lower refractive index than the peripheral core portion,

wherein the core comprises a peripheral core portion, a second ring portion, and a third ring portion provided in that order on the central core portion and when the relative refractive index difference and radius of the central core portion, the peripheral core portion, the second ring portion, and the third core portion are set respectively as $(\Delta 1, r_1)$, $(\Delta 2, r_2)$, $(\Delta 3, r_3)$, and $(\Delta 4, r_4)$ when the cladding is taken as a reference, then the dispersion shifted optical fiber has a refractive index profile in which $\Delta 1$ and $\Delta 3$ are set as negative values, $\Delta 2$ is set as a positive value, and $\Delta 4$ is set as 0 or more, and in a used wavelength band selected from 1490 to 1625 nm, the dispersion shifted optical fiber has an effective core area of 75 to 100 μm^2 , a dispersion slope of 0.06 to 0.09 ps/km/nm², a chromatic dispersion value of -8 to +8 ps/km/nm, a bending loss of 100 dB/m or less, and a cutoff wavelength that provides essentially single mode propagation,

wherein the chromatic dispersion value is a negative value and $-0.50\% \leq \Delta 1 \leq -0.20\%$, $0.65\% \leq \Delta 2 \leq 0.85\%$, $-0.50\% \leq \Delta 3 \leq -0.25\%$, $0.0\% \leq \Delta 4 \leq 0.30\%$, $1.3 \leq r_2 / r_1 \leq 2.5$, $0.5 \leq (r_3 - r_2) / r_1 \leq 1.5$, $0.5 \leq (r_4 - r_3) / r_2 \leq 2.0$.

Claim 26 (new): A dispersion shifted optical fiber comprising a core and cladding provided at an outer periphery of the core, and having a refractive index profile in which

the core is provided with a central core portion and a peripheral core portion having a higher refractive index than the central core portion provided at an outer periphery of the central core portion, and

the cladding has a lower refractive index than the peripheral core portion,

wherein the core comprises a peripheral core portion, a second ring portion, and a third ring portion provided in that order on the central core portion and when the relative refractive index difference and radius of the central core portion, the peripheral core portion, the second ring portion, and the third core portion are set respectively as $(\Delta 1, r1)$, $(\Delta 2, r2)$, $(\Delta 3, r3)$, and $(\Delta 4, r4)$ when the cladding is taken as a reference, then the dispersion shifted optical fiber has a refractive index profile in which $\Delta 1$ and $\Delta 3$ are set as negative values, $\Delta 2$ is set as a positive value, and $\Delta 4$ is set as 0 or more, and in a used wavelength band selected from 1490 to 1625 nm, the dispersion shifted optical fiber has an effective core area of 75 to 100 μm^2 , a dispersion slope of 0.06 to 0.09 ps/km/nm², a chromatic dispersion value of -8 to +8 ps/km/nm, a bending loss of 100 dB/m or less, and a cutoff wavelength that provides essentially single mode propagation,

wherein the chromatic dispersion value is a positive value and $-0.50\% \leq \Delta 1 \leq -0.05\%$, $0.65\% \leq \Delta 2 \leq 0.85\%$, $-0.50\% \leq \Delta 3 \leq -0.15\%$, $0.0\% \leq \Delta 4 \leq 0.30\%$, $1.3 \leq r2 / r1 \leq 3.0$, $0.5 \leq (r3 - r2) / r1 \leq 2.5$, $0.5 \leq (r4 - r3) / r2 \leq 2.0$.

Claim 27 (new): A dispersion shifted optical fiber comprising a core and cladding provided at an outer periphery of the core, and having a refractive index profile in which

the core is provided with a central core portion and a peripheral core portion having a higher refractive index than the central core portion provided at an outer periphery of the central core portion, and

the cladding has a lower refractive index than the peripheral core portion,

wherein the core comprises a peripheral core portion, a second ring portion, and a third ring portion provided in that order on the central core portion and when the relative refractive index difference and radius of the central core portion, the peripheral core portion, the second ring portion, and the third core portion are set respectively as $(\Delta 1, r1)$, $(\Delta 2, r2)$, $(\Delta 3, r3)$, and

($\Delta 4$, $r4$) when the cladding is taken as a reference, then the dispersion shifted optical fiber has a refractive index profile in which $\Delta 1$ and $\Delta 3$ are set as negative values, $\Delta 2$ is set as a positive value, and $\Delta 4$ is set as 0 or more, and in a used wavelength band selected from 1490 to 1625 nm, the dispersion shifted optical fiber has an effective core area of 100 to 120 μm^2 , a dispersion slope of 0.08 to 0.10 ps/km/nm², a chromatic dispersion value of 0.5 to 8 ps/km/nm, a bending loss of 100 dB/m or less, and a cutoff wavelength that provides essentially single mode propagation,

wherein the chromatic dispersion value is a positive value and $-0.50\% \leq \Delta 1 \leq -0.25\%$, $0.65\% \leq \Delta 2 \leq 0.75\%$, $-0.50\% \leq \Delta 3 \leq -0.25\%$, $0.0\% \leq \Delta 4 \leq 0.30\%$, $1.3 \leq r2 / r1 \leq 2.5$, $0.5 \leq (r3 - r2) / r1 \leq 1.5$, $0.5 \leq (r4 - r3) / r2 \leq 2.0$.